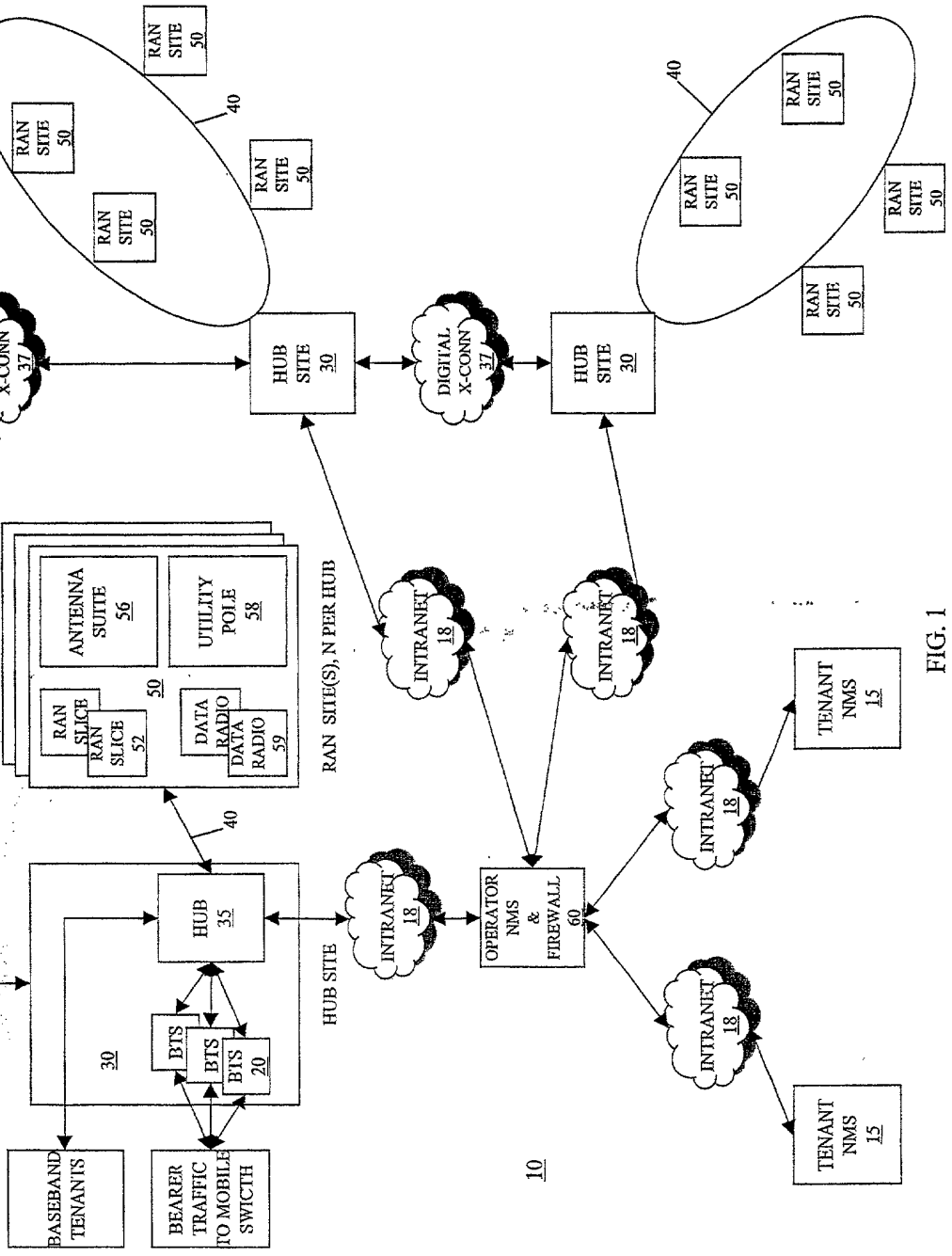
RAN SITE 50
40
DIGITAL X-CONN 37
HUB SITE 30
INTRANET 18
ANTENNA SUITE 56
UTILITY POLE 58
RAN SLICE 52
DATA RADIO 59
50
RAN SITE(S), N PER HUB
HUB 35
BTS 20
30
HUB SITE
OPERATOR NMS & FIREWALL 60
TENANT NMS 15
BASEBAND TENANTS
BEARER TRAFFIC TO MOBILE SWICTH
10

FIG. 1

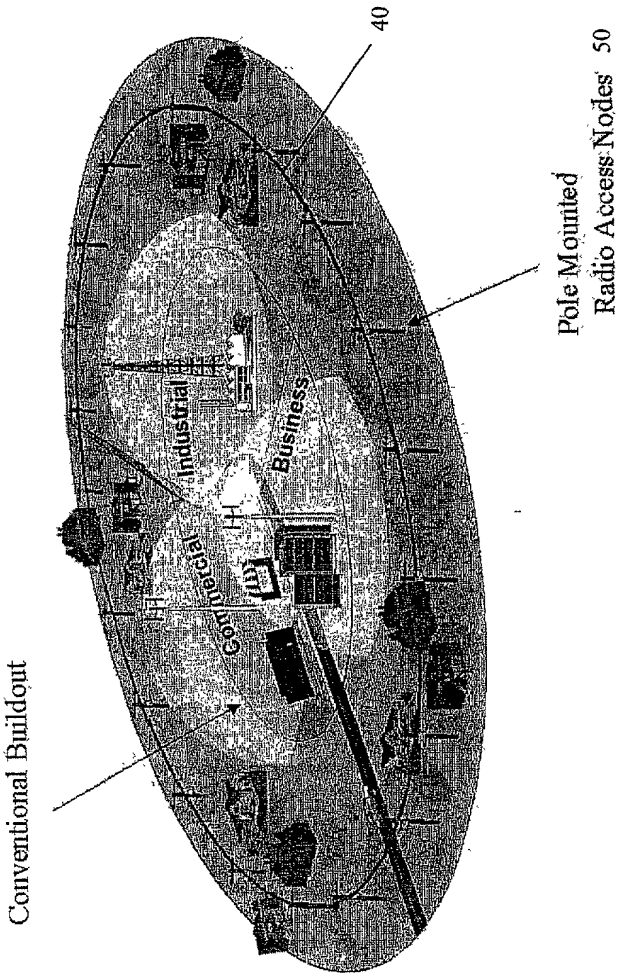
40
Pole Mounted
Radio Access Nodes 50
Conventional Buildout
Industrial
Business
Commercial
10

FIG. 2

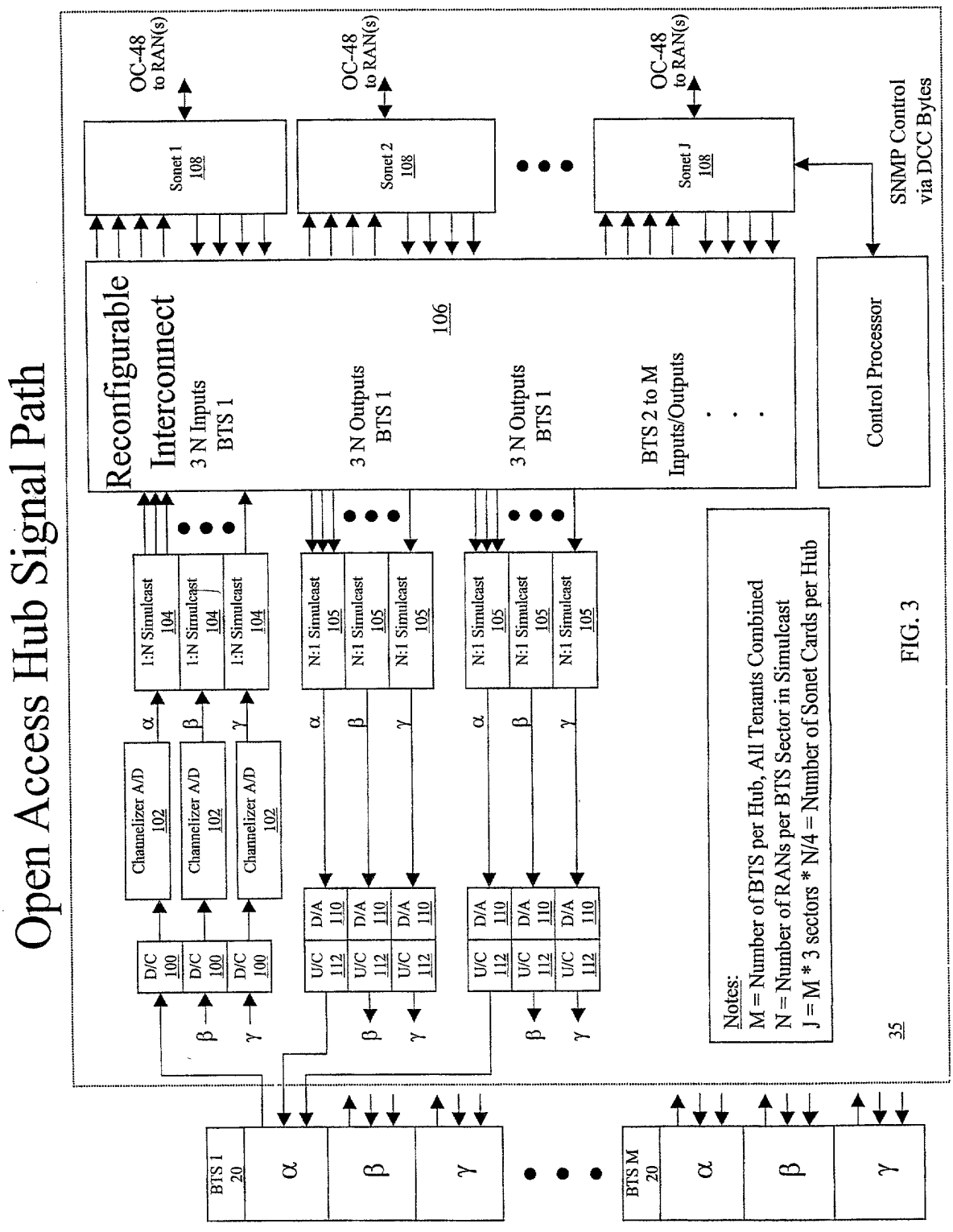
Open Access Hub Signal Path
OC-48 to RAN(s)
Sonet 1 108
Sonet 2 108
Sonet J 108
SNMP Control via DCC Bytes
Reconfigurable Interconnect
106
3 N Inputs BTS 1
3 N Outputs BTS 1
3 N Outputs BTS 1
BTS 2 to M Inputs/Outputs
Control Processor
Channelizer A/D 102
D/C 100
1:N Simulcast 104
N:1 Simulcast 105
U/C 112
D/A 110
α
β
γ
BTS 1 20
BTS M 20
Notes:
M = Number of BTS per Hub, All Tenants Combined
N = Number of RANs per BTS Sector in Simulcast
J = M * 3 sectors * N/4 = Number of Sonet Cards per Hub
35

FIG. 3

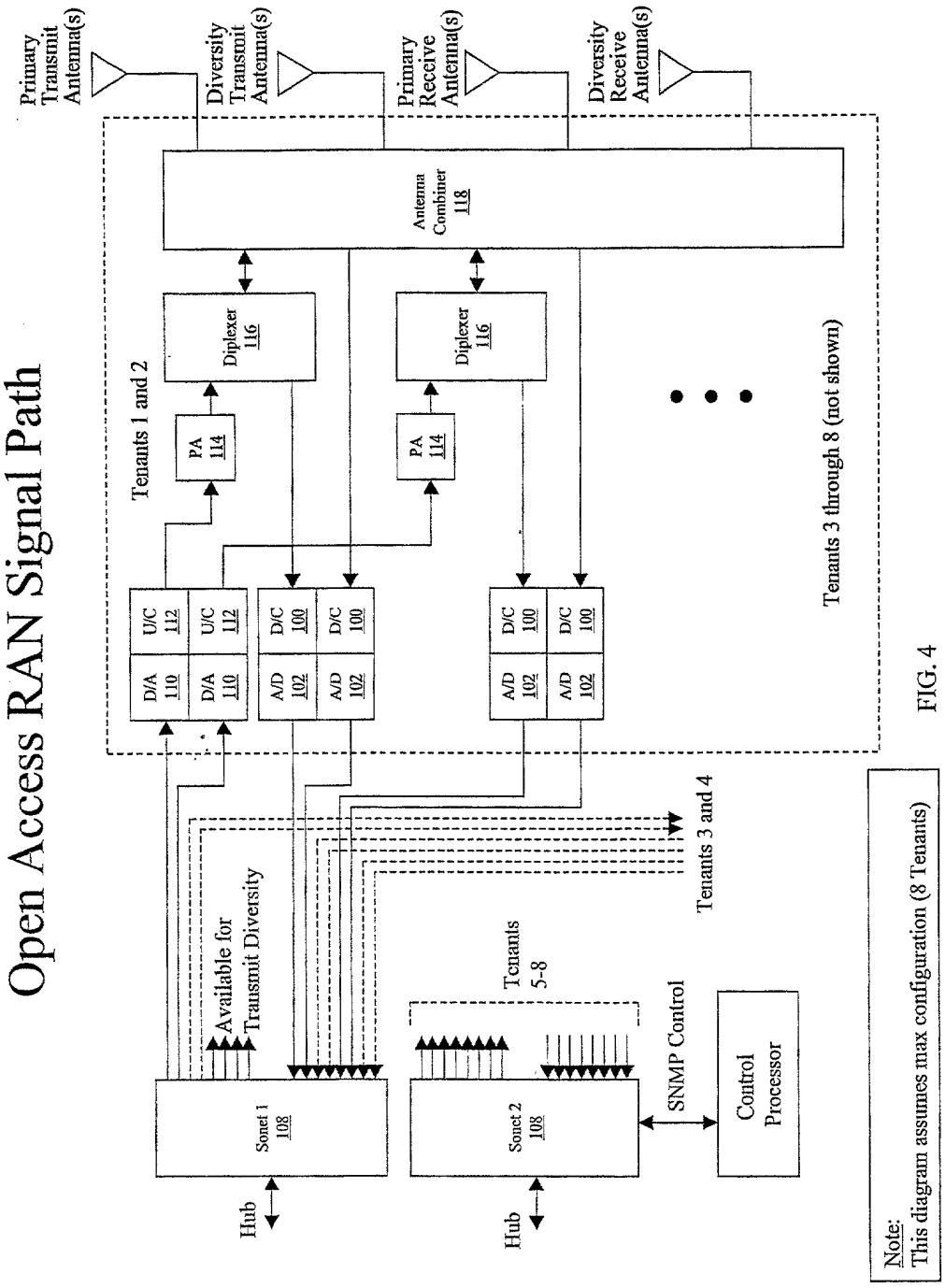
Open Access RAN Signal Path
Primary Transmit Antenna(s)
Diversity Transmit Antenna(s)
Primary Receive Antenna(s)
Diversity Receive Antenna(s)
Antenna Combiner 118
Diplexer 116
Diplexer 116
PA 114
PA 114
Tenants 1 and 2
Tenants 3 through 8 (not shown)
U/C 112
U/C 112
D/A 110
D/A 110
D/C 100
D/C 100
A/D 102
A/D 102
D/C 100
D/C 100
A/D 102
A/D 102
Available for Transmit Diversity
Tenants 3 and 4
Tenants 5-8
SNMP Control
Control Processor
Sonet 1 108
Sonet 2 108
Hub
Hub
Note:
This diagram assumes max configuration (8 Tenants)

FIG. 4

Simulcast Varied to Equalize Reverse Link Budgets
and to Balance With Forward Link Budget

| | CDMA | TDMA | GSM1900 |
|---|---|---|---|
| Reverse Link | | | |
| Mobile Transmit Power | 23 dBm | 28 dBm | 30 dBm |
| RAN Sensitivity | -120 dBm | -111 dBm | -110 dBm |
| Allowable Reverse Path Loss without Simulcast | 143 dB | 139 dB | 140 dB |
| Number in Simulcast | 8 | 3 | 4 |
| Allowable Reverse Path Loss with Simulcast | 134 dB | 134 dB | 134 dB |
| Forward Link | | | |
| RAN Transmit Power per Traffic Channel | 20 dBm | 32 dBm | 32 dBm |
| Mobile Sensitivity less Interference Margin | -114 dBm | -102 dBm | -102 dBm |
| Allowable Forward Path Loss | 134 dB | 134 dB | 134 dB |

FIG. 5

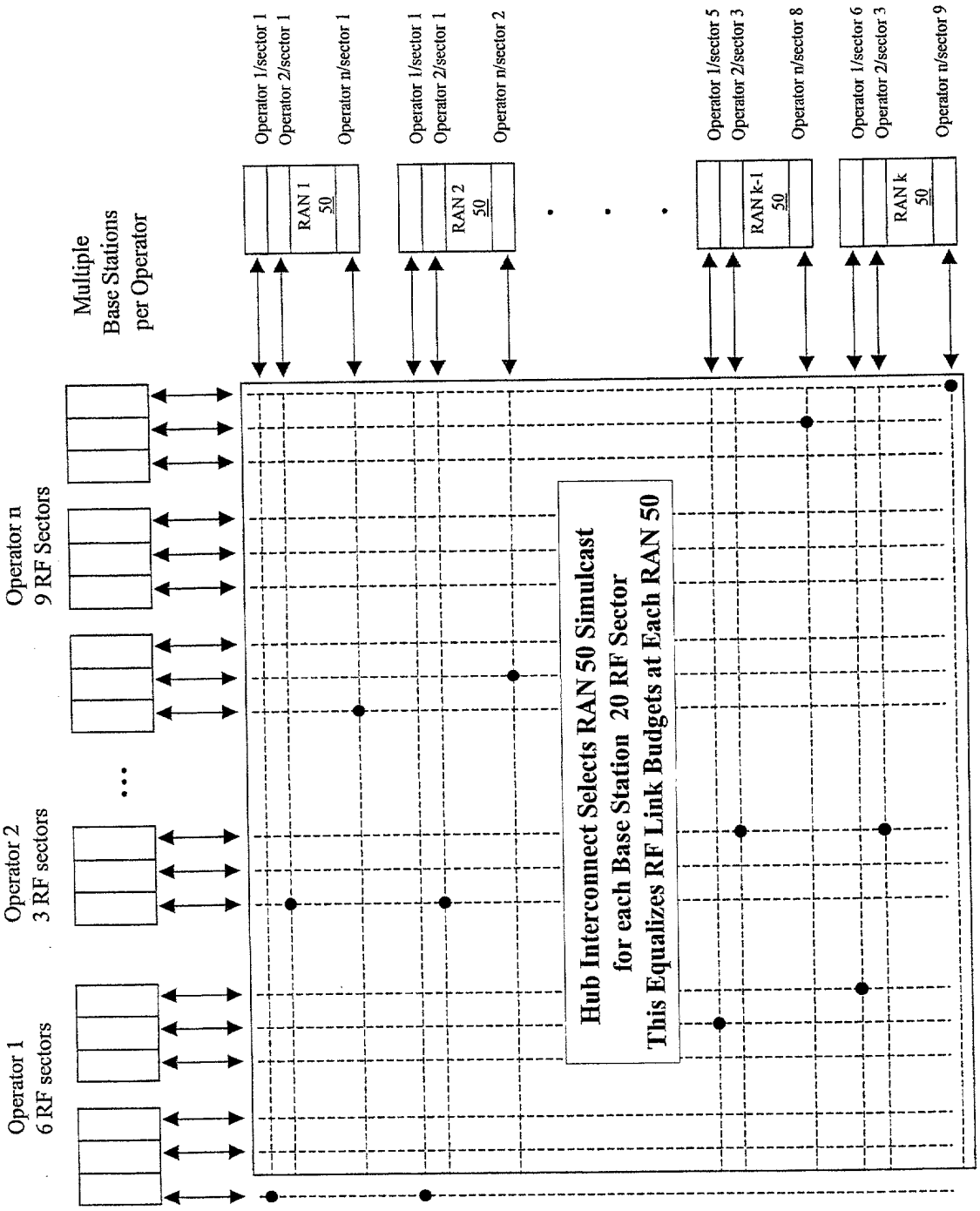
Operator 1
6 RF sectors
Operator 2
3 RF sectors
Operator n
9 RF Sectors
Multiple
Base Stations
per Operator
Operator 1/sector 1
Operator 2/sector 1
Operator n/sector 1
RAN 1
50
Operator 1/sector 1
Operator 2/sector 1
Operator n/sector 2
RAN 2
50
Operator 1/sector 5
Operator 2/sector 3
Operator n/sector 8
RAN k-1
50
Operator 1/sector 6
Operator 2/sector 3
Operator n/sector 9
RAN k
50
Hub Interconnect Selects RAN 50 Simulcast
for each Base Station 20 RF Sector
This Equalizes RF Link Budgets at Each RAN 50

FIG. 6

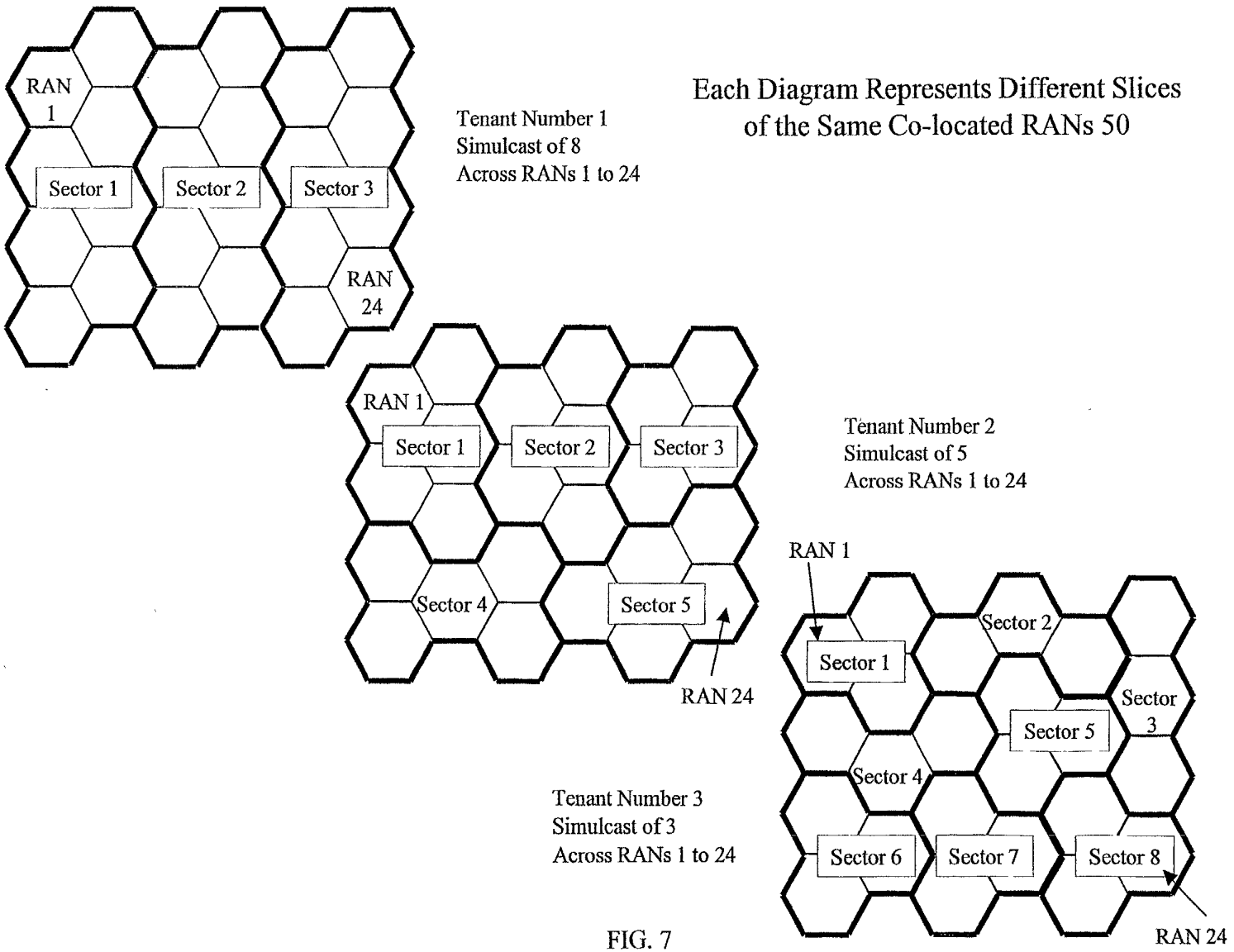
Each Diagram Represents Different Slices
of the Same Co-located RANs 50
RAN
1
Sector 1
Sector 2
Sector 3
RAN
24
Tenant Number 1
Simulcast of 8
Across RANs 1 to 24
RAN 1
Sector 1
Sector 2
Sector 3
Sector 4
Sector 5
RAN 24
Tenant Number 2
Simulcast of 5
Across RANs 1 to 24
RAN 1
Sector 1
Sector 2
Sector
3
Sector 4
Sector 5
Sector 6
Sector 7
Sector 8
RAN 24
Tenant Number 3
Simulcast of 3
Across RANs 1 to 24

FIG. 7

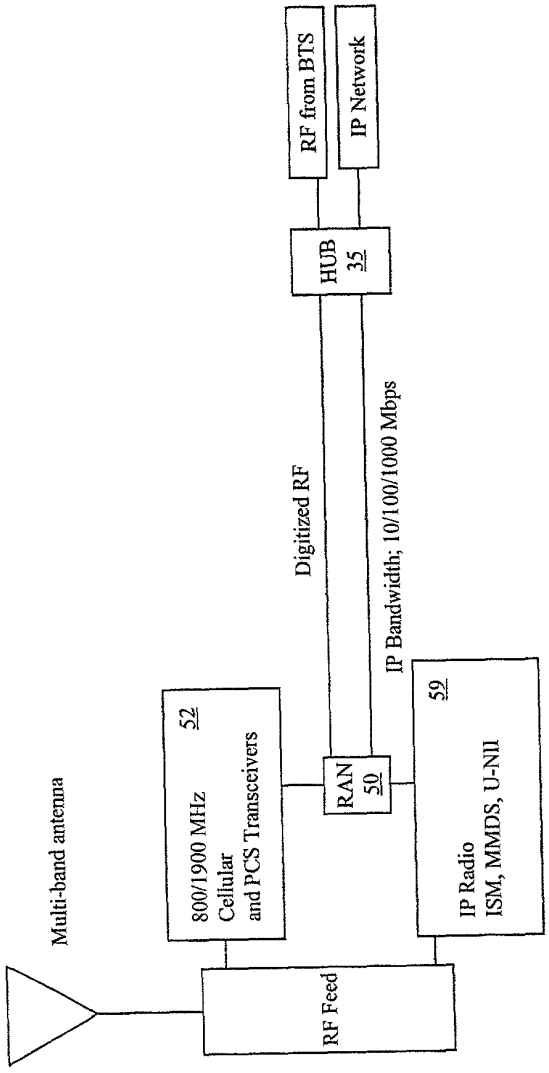
RF from BTS
IP Network
HUB
35
Digitized RF
IP Bandwidth; 10/100/1000 Mbps
Multi-band antenna
800/1900 MHz
Cellular
and PCS Transceivers
52
RAN
50
59
IP Radio
ISM, MMDS, U-NII
RF Feed

FIG. 8

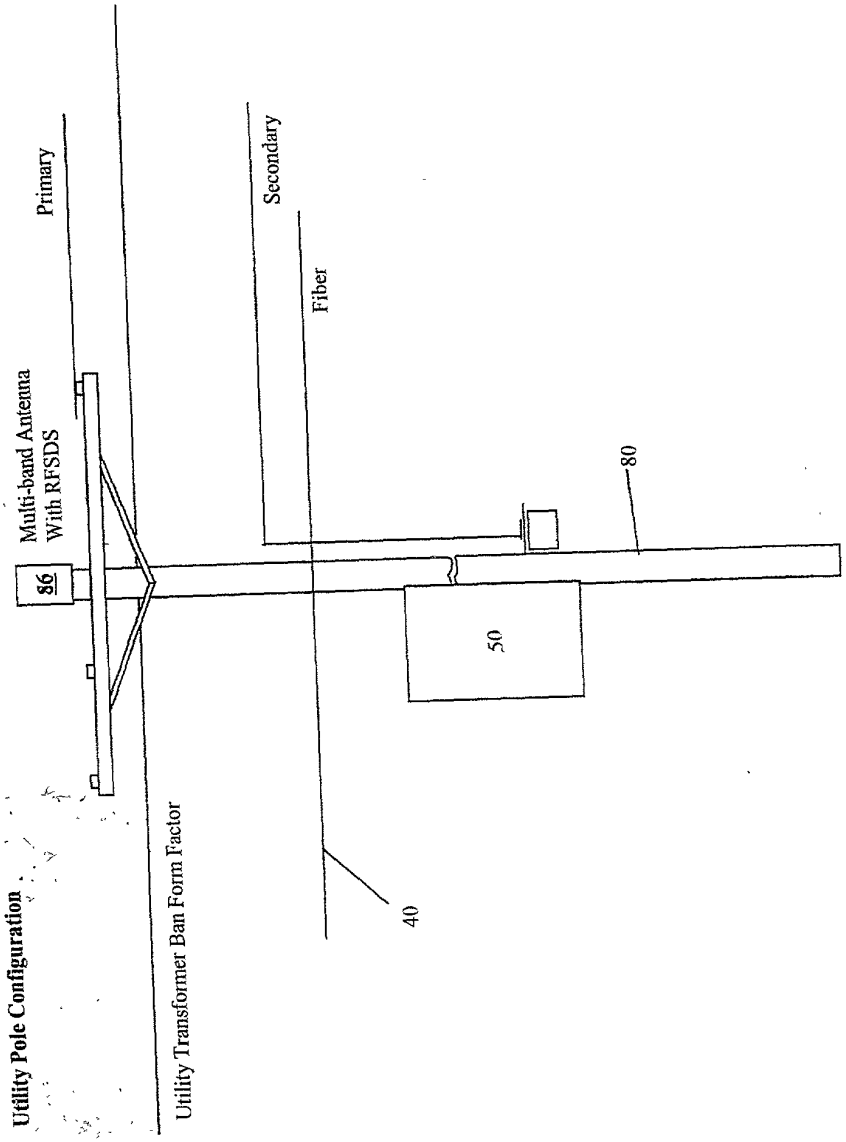
Utility Pole Configuration
Utility Transformer Ban Form Factor
Primary
Secondary
Fiber
Multi-band Antenna
With RFSDS
86
40
50
80

FIG. 9